

Operating Experience Summary



Office of Nuclear and Facility Safety

March 11 — March 27, 2000

Summary 2000-06

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Operating Experience Summary 2000-06

March 11 through March 27, 2000

Table of Contents

EVENTS	1
1. FOUR PERSONNEL RECEIVE POTENTIAL INTAKE OF PU-238.....	1
2. DEFICIENT FIRE SPRINKLER HEAD OVERLOOKED IN RECALL	1
3. INSTALLATION OF INCORRECT WIRE ROPE SIZE ON MONORAIL HOIST	2
4. FAILURE TO USE FALL PROTECTION.....	3
5. ELECTRICAL CABLE DAMAGED DURING EXCAVATION	4
6. ABANDONED ENERGIZED CABLES DISCOVERED AT BIG HILL SITE	5
7. WASTE PACKAGING OPERATION CONTRIBUTES TO SMOLDERING FIRE.....	6
8. ELECTRICAL SYSTEM IMPROPERLY GROUNDED.....	8
9. WORKER PINNED BY THREE THOUSAND POUND WASTE CRATE	9

EVENTS

1. FOUR PERSONNEL RECEIVE POTENTIAL INTAKE OF PU-238

On March 16, 2000, at Los Alamos National Laboratory, four employees tested positive for nasal contamination after a continuous air monitor (CAM) alarmed in the glovebox room where they were working. They evacuated the room to an adjacent corridor. All workers were whole-body counted and surveyed for contamination. Four were contaminated and had positive nasal smears and one had significantly higher levels of nasal activity. CAMs in the adjacent room also alarmed, although there were no employees present in these rooms. A type A investigation has begun, and further results will be reported in a future article. (ORPS Report ALO-LA-LANL-TA55-2000-0009)

A power technology employee was performing a maintenance evaluation on a glovebox to determine why there was no Argon gas flow to the glovebox. While the evaluation was being performed, CAMs alarmed and personnel left the room and entered a corridor. The rooms are designed to maintain a negative pressure in relation to the corridors. Four of the eight personnel in the room were found contaminated and were decontaminated to a no-detectable-contamination level. All personnel were placed on an immediate bioassay sampling program.

KEYWORDS: contamination, Pu-238, personnel, uptakes, glove box

FUNCTIONAL AREAS: Personnel contamination

2. DEFICIENT FIRE SPRINKLER HEAD OVERLOOKED IN RECALL

On March 3, 2000, at Pantex, while performing a routine inspection for sprinkler head encrustation, a fire protection engineer discovered a fire sprinkler head of a design that had been recalled. The facility manager requested that Pantex craftsmen replace the defective sprinkler head and that the prime contractor remove all combustible materials from the unprotected area. Failure to perform independent inspections can lead to system failures that can result in personnel injury and facility or equipment damage. (ORPS No. ALO-AO-MHC-PANTEX-2000-0018).

Investigators determined that the sprinkler manufacturer should have replaced the faulty unit in July 1998 when they were contracted to change all defective sprinklers at the facility. Investigators determined that the deficient sprinkler head is located in an out-of-the-way spot above an air handler unit and that the manufacturer missed it because he did not refer to the proper as-built drawings. They also determined that the prime contractor did not perform an independent inspection to verify that the manufacturer completed the task satisfactorily. Investigators determined that although the sprinkler head was defective, it would probably still have functioned at the normal sprinkler system operating pressure.

EH engineers identified the following similar events involving faulty fire protection sprinkler heads.

- Operating Experience Summary 99-02 reported that on June 12, 1998, at the Argonne National Laboratory-East, fire protection engineers determined that 11 of 12 sprinkler heads failed to operate when tested. They were testing the sprinklers because of problems identified in Occurrence Report CH-AA-ANLE-ANLEPFS-1998-0004. None of the sprinklers were internally obstructed with foreign material, though all exhibited signs of external corrosion. The sprinkler heads failed to operate because of an inadequate O-ring seal. This resulted in a buildup of corrosion products on the exterior of the sprinkler that would render the valves inoperable during a fire or related event. (ORPS Report CH-AA-ANLE-ANLEESH-1998-0001)
- On October 14, 1998, the U.S. Consumer Product Safety Commission (CPSC) officially recalled the Omega brand fire sprinklers that have been manufactured since 1982 by Central Sprinkler Corporation and a subsidiary, Central Sprinkler Company. The CPSC staff believes that these sprinklers are defective and are likely to fail in a fire situation. The sprinklers may not properly activate in the event of a fire, thus exposing the public to bodily injury or death. Central Sprinkler will replace the Omega sprinklers at no cost with glass bulb fire sprinklers and will reimburse consumers for some costs associated with removing and replacing the

sprinklers. CPCS is aware of 17 fires in which Omega fire sprinklers reportedly failed to operate, resulting in at least four injuries and over \$4.3 million in property damage. (Press Release 99-008)

- Operating Experience Summary 97-49 reported that on November 26, 1997, at the Hanford Site Plutonium Finishing Plant, a fire system cognizant engineer notified the building emergency director that three of seven Omega flow control sprinklers removed from the facility for testing by the manufacturer failed during testing. The manufacturer, Central Sprinkler Corporation, notified customers of a potential defect with their Omega series sprinklers and asked them to submit samples for testing. Underwriter's Laboratory recommends that these sprinklers flow water at a minimum pressure of 7 psig. The three sprinklers that failed did not flow water until the test pressure reached 12, 20, and 50 psig. The water pressure in the Plutonium Finishing Plant fire suppression system is greater than 100 psig. The fire system cognizant engineer determined that fire suppression systems remained operable because the system water pressure was so much greater than the operating pressures for the failed sprinklers. The vendor will replace all of the approximately 780 Omega sprinklers at the Plutonium Finishing Plant. Failures of this type may allow fires to result in excessive damage to facilities or endanger the lives of building occupants. (ORPS Report RL--PHMC-PFP-1997-0050)

EH engineers identified the following similar events involving the lack of independent verification.

- Operating Experience Summary 98-19 reported that on May 5, 1998, at the Idaho National Environmental Engineering Advanced Test Reactor Facility, a facility manager reported that operators inserted an experiment capsule into the wrong capsule irradiation position. Because the capsule was in the wrong position, it was not discharged from the reactor as scheduled and was over-irradiated. The facility manager directed operators to complete a full inventory of all other experiment irradiation positions. They determined there were no other reactor experiment loading anomalies. Nuclear Safety Technical Support personnel reviewed the experiment safety analysis report and determined that inserting the capsule in the wrong core position and over-irradiating it did not constitute a safety concern. (ORPS Report ID--LITC-ATR-1998-0008)

KEYWORDS: fire, sprinkler, inspection

FUNCTIONAL AREAS: Fire Protection, Industrial Safety, Material Handling/Storage

3. INSTALLATION OF INCORRECT WIRE ROPE SIZE ON MONORAIL HOIST

On March 9, 2000, at Savannah River, maintenance riggers reported a concern that they had installed the incorrect wire rope on a monorail hoist during corrective maintenance. The Maintenance Manager investigated and confirmed the mistake. He tagged the monorail hoist out of service, and prepared a nonconformance report for disposition of the wire rope. The monorail was not put back in service and no workers were injured as a result of the occurrence. Deficiencies in corrective maintenance work control can lead to degraded safety and worker injury. (ORPS Report SR--WSRC-FCAN-2000-0007)

Riggers were performing scheduled corrective maintenance on the new warm crane south monorail hoist at F-Canyon. Investigators found that a technical work document was not used to control work and spare parts. Two new riggers were handed a spool of $\frac{3}{16}$ " stainless steel wire rope by a supervisor who last performed a rigging job 5 years ago. The wire rope replacement for the new warm crane is a different size wire rope from that used on the new hot crane. Carbon steel $\frac{1}{4}$ " wire rope is used on the new warm crane south monorail hoist to maintain a 5:1 safety factor for lifts. A $\frac{3}{16}$ " stainless steel wire rope that has 50% less load carrying capacity is used on the new hot crane because it operates in the offgas of a highly acidic nitric acid environment. Operators are instructed to break the wire rope to free the hook if it becomes stuck so the crane can be moved to another location.

Investigators determined that all maintenance work on site should be processed through a work management center using the computer database PASSPORT. Investigators determined that the supervisor for corrective maintenance in F-Area does not have access to PASSPORT. Therefore, corrective maintenance jobs are performed without the required formal work request. Preventive maintenance, performed by a different organization, is controlled by PASSPORT. F-Canyon management intends to correct this oversight by connecting all corrective maintenance activities to the PASSPORT data base.

EH engineers identified the following similar event involving wire rope replacement on overhead cranes.

- Operating Experience Summary 99-26 reported that on June 9, 1999, at the Pacific Northwest National Laboratory (PNNL), a preventive maintenance specialist discovered that the PNNL preventive maintenance group had failed to reinstate the monthly wire rope inspection required to restore a 2-ton beam crane to operability following a prolonged deactivation. On June 16, 1999, while performing the reinstated inspection, a millwright discovered that the wire rope on the crane did not match the load block sheave size and that the latch on the load hook was bent and would not function properly. Sheave grooves should match the rope size as closely as possible in order to maximize the service life of the rope and prevent the rope cross-section from deforming under load. (ORPS Report RL--PNNL-PNNLBOPER-1999-0021)

KEYWORDS: overhead crane, maintenance, corrective maintenance, work control

FUNCTIONAL AREAS: Maintenance, Configuration Management

4. FAILURE TO USE FALL PROTECTION

On March 10, 2000, at the West Valley Demonstration Project, safety and health personnel observed a subcontractor employee on a roof without fall protection. The worker was signaled by the safety engineer to step away from the roof edge. The edge of the roof was approximately 15 feet above a lower level roof. Prompt action by the safety engineer corrected a serious fall hazard condition. Working at heights without fall protection is an imminent danger condition which can be resolved by utilizing adequate fall protection. (ORPS Report OH-WV-WVNS-WVNSGEN-2000-0001)

Investigators determined that the subcontractor was performing survey work on a roof without fall protection training. The survey was necessary to complete an enclosure to a room where the wall had been removed and allowed a direct path on to the roof and its edge. Investigators determined that the survey work was suspended and the worker was recalled from the roof. Investigators are reviewing the site indoctrination and work planning programs for improvements

EH has reported numerous fall protection violations in the Operating Experience Summary. Following are some examples.

- Summary 98-44 reported that a facility management walk-around team at Los Alamos National Laboratory Plutonium Processing and Handling Facility observed two subcontractor pipe fitters violating fall protection procedures while installing copper tubing on a boiler replacement project. One pipefitter was standing on a 3-inch diameter pipe suspended 10 to 12 feet above the floor. The other pipefitter was on a stepladder and attempting to solder while he was holding acetylene bottles. Neither was using fall protection equipment, which violated facility procedures and OSHA requirements. The walk-around team directed the pipefitters to stop work immediately. Investigators determined that neither worker had completed general hazard awareness training, scaffolding training, or ladder safety training. (ORPS Report ALO-LA-LANL-TA55-1998-0048)
- Summary 98-05 reported that a construction safety coordinator at Lawrence Berkeley National Laboratory performing a daily safety compliance inspection observed subcontracted workers violating safety procedures while removing ductwork. One worker was standing on a crane walkway with the crane not locked out or tagged out, as required by facility procedures. Another worker was working on a maintenance platform approximately 25 feet high without using fall protection equipment. (ORPS Report SAN--LBL-OPERATIONS-1998-0002)

These occurrences underscore the importance of establishing and enforcing an effective fall protection program. OSHA 3146, *Fall Protection in Construction*, provides an overview and discussion of fall protection topics and related standards. The introduction to this publication states that falls are the leading cause of worker fatalities in the construction industry in the United States. Each year, on average, falls at construction sites kill between 150 and 200 workers and injure more than 100,000. OSHA recognizes that accidents involving falls are usually complex events that involve a variety of factors. Consequently, the OSHA standard for fall protection includes both human and equipment-related issues in protecting workers from fall hazards. For example, employers and employees need to do the following.

- Where protection is required, select fall protection systems appropriate for the situation.
- Ensure that safety systems are properly constructed and installed.
- Supervise employees properly.
- Use safe work procedures.
- Train workers in the proper selection, use, and maintenance of fall protection systems.

Workers need to realize that safety requirements are developed to protect them, not simply to satisfy requirements. In general, DOE prime contractors have satisfactorily incorporated the requirements of 29 CFR 1926, Subpart M, Fall Protection, into site and facility construction and procurement programs. However, fall protection safety violations continue to occur throughout the complex, principally among subcontractors, for reasons that are difficult to determine. Subcontracted construction workers come from a variety of backgrounds, not all of which may promote the level of safety consciousness required of DOE contractor and subcontractor employees. Employees may feel that using fall protection equipment is bothersome, unnecessary for skilled and physically fit workers. In some cases, situations may arise that work planners had not anticipated, and workers may not recognize the need for fall protection equipment. Subpart M of 29 CFR 1926 requires employers to provide training for employees who might be exposed to fall hazards so that they recognize such hazards and take steps to minimize them. Employees must be trained in the nature of fall hazards in the work area, the standards of Subpart M, and the role of employees in fall protection plans. Employers must prepare a written certification that identifies the employee trained and the date of the training, and the employer or trainer must sign the certification record. In addition, pre-job briefings and walk-downs should include identification of fall hazards and discussion of the protective equipment to be used.

OSHA 3146 and other information related to fall protection can be downloaded from the OSHA construction home page at <http://www.osha-slc.gov/html/construction.html>.

KEYWORDS: construction, fall protection

FUNCTIONAL AREAS: Construction, Industrial Safety, Work Planning

5. ELECTRICAL CABLE DAMAGED DURING EXCAVATION

On March 20, 2000, at the Idaho Nuclear Technology and Engineering Center, a backhoe operator snagged and broke a de-energized 480-volt underground cable during excavation for a new electrical duct bank. Investigators found that the cable was not locked and tagged out by the construction workers. The cable did have a red OSHA lockout/tagout applied for an unrelated grounding problem. There were no injuries and, except for the cut cable, no other equipment was damaged. The existence of energy in buried lines needs to be verified prior to excavation around the lines. Excavation around electrical lines can result in injury and potentially death. (ORPS Report ID--BBWI-LANDLORD-2000-0010)

The cable was designed to supply area lighting for security purposes. Investigators learned that the breaker on the 480-volt line was previously opened to repair a suspected short to ground in the circuit. A Ground Penetrating Radar underground survey identified the presence of the line approximately 2 feet 10 inches below the surface. Workers dug a trench by hand in the area of the line according to procedure but they did not locate the buried cable. The backhoe operator then decided to fine-grade the bottom of the trench. The line was located approximately 3 inches below the trench bottom and it was snagged and broken by the backhoe.

The Plant Shift Supervisor stopped work immediately and reported the incident to construction management. Investigators located the power source for the line, verifying that it was de-energized. Construction personnel then hung a construction lockout/tagout on the line.

EH engineers have reported similar occurrences involving cutting buried electrical cables in the following Summaries.

- Operating Experience Summary 00-05 reported that on February 21, 2000, at Savannah River, a backhoe operator cut through an energized 480-volt underground cable during excavation of a new sanitary sewer line.

The cut cable tripped a breaker and caused a near miss. Investigators found the tripped breaker, moved it to the off position, and locked it out until repairs could be completed. There were no injuries and, except for the cut cable, no other equipment was damaged. (ORPS Report SR--WSRC-MD-2000-0004)

- Operating Experience Summary 98-05 reported that on January 20, 1999, at the West Valley Demonstration Project in the High Level Waste Tank Farm, a heavy equipment operator severed a 480-V extension cord when the bucket of the front-end loader that the operator was using to remove snow struck the extension cord. On January 1, 1999, workers had run the extension cord approximately 120 feet along the ground from an outdoor breaker box to an electric space heater. Several feet of snow fell and had to be removed to allow fork truck operation in the tank farm. The extension cord was not identified in the walk-down and was not discussed in the pre-job planning. (ORPS Report OH-WV-WVNS-HLLW-1999-0001)
- Operating Experience Summary 97-41 reported that on September 30, 1997, at a Los Alamos National Laboratory construction site, a subcontract backhoe operator pulled two de-energized 480-volt cables through a conduit with the teeth of the backhoe bucket and across an energized bus bar. The two cables pulled loose from their breaker connections inside a 480-volt switchgear and re-energized when the exposed copper cable ends contacted the incoming side of the energized bus bar. When the backhoe operator saw sparks, he immediately raised the bucket and moved the backhoe out of the area. Investigators determined that a communication error between the backhoe operator and a crew of electricians resulted in the incident. The backhoe operator incorrectly believed the electricians had already cut the cable to allow its removal. (ORPS Report ALO-LA-LANL-LANL-1997-0001)

KEYWORDS: electrical, cable, backhoe

FUNCTIONAL AREAS: Construction, Configuration Management, Industrial Safety

6. ABANDONED ENERGIZED CABLES DISCOVERED AT BIG HILL SITE

On March 21, 2000, the Big Hill Strategic Petroleum Reserve reported that 30 abandoned energized cables were found during a survey to verify electrical panel legends and circuits. The Big Hill site recently completed several major life extension projects, during which many of the electrical systems were rebuilt or replaced. Abandoned circuits and demolished equipment were to be disconnected and removed. Instead investigators found wires to abandoned equipment cut at the equipment, but left connected and energized. Abandoned energized electrical wires pose a significant risk of worker injury. (HQ—SPR-BH-2000-0002)

The four Strategic Petroleum Reserve (SPR) sites were created in 1977. The life expectancy was 20 years. Major life extension projects to upgrade facilities and streamline systems has been underway at all four sites for the last 8 years. The Big Hill site is the last of the facilities to complete construction, which involved demolishing and removing abandoned pumps, valves, and other equipment. The intent of the construction contract was to “air gap” unneeded circuits at the breaker and completely remove the cable to the abandoned equipment. Investigators found the cables associated with these 120-volt circuits disconnected from the equipment but still connected to the breakers and energized. Electricians expected to find abandoned wires as shown on contractor red-lined drawings, but not energized cables. Investigators found that the contractor simply cut the cable near the demolished equipment and left the circuits abandoned and energized in the cable trays. Site electricians found a number of energized circuits in three different motor control centers and the field instrument buildings. Five teams of two electricians are conducting a thorough inspection and verification of all panels and panel legends.

Investigators believe a configuration management problem exists in both a breach of contract on the part of the construction contractor and inadequate oversight by construction management in regard to inspection of the removal of cables. This contractor performed similar work at one of the other SPR sites and may have left undiscovered abandoned energized cables at that work site as well. As a result, the Big Hill DOE Senior Site Representative issued a warning to the other sites to thoroughly inspect all electrical panels for possible abandoned energized cables, to treat all cables as “hot” until checked. The panel inspection will continue at Big Hill site until all site panels have been inspected and verified that no abandoned energized cables remain on site.

EH engineers have reported similar occurrences involving abandoned electrical cables in the following summaries:

- Operating Experience Summary 99-12 reported that on March 10, 1999, at the Strategic Petroleum Reserves Big Hill Site, a subcontractor electrician caused an electrical arc while pulling cables into a 480-V power

distribution panel for a load center. The arc occurred when he replaced what he believed was a de-energized spare cable back into the raceway. As a result, a breaker in the power distribution panel tripped, causing an emergency generator to start. Site electricians responded to the event, shut down the emergency generator, and restored normal commercial power. The shift supervisor ordered facility personnel to stop all electrical activities in the area. The subcontractor electrician, who was wearing the appropriate personal protective equipment for pulling cable, was not injured and no equipment was damaged.

(ORPS Report HQ--SPR-BH-1999-0003)

- Operating Experience Summary 98-31 reported that on July 24, 1998, at Lawrence Livermore National Laboratory, an electrician received a minor shock when he touched a smoke detector head cover with a wrench while removing empty conduit from a ceiling. Maintenance personnel determined that the fire detection system was inadequately grounded and the detector was energized to 83 volts dc, 340 milliamps. The electrician stopped work and called Hazards Control personnel for assistance. Emergency Services personnel responded and transported the electrician to an on-site medical facility. Medical personnel determined that the electrician did not suffer any adverse effects from the shock. The facility manager prohibited overhead work and warned facility personnel to remain clear of smoke-detector heads. He also directed facility personnel to place the facility in maintenance mode so maintenance personnel could further diagnose the problem. (ORPS Report SAN--LLNL-LLNL-1998-0040)

KEYWORDS: abandoned cable, work control

FUNCTIONAL AREAS: Construction, Electrical Engineering, Configuration Management

7. WASTE PACKAGING OPERATION CONTRIBUTES TO SMOLDERING FIRE

On March 11, 2000, at Brookhaven National Laboratory, a worker discovered a smoldering fire near the waste pit excavation area. The worker alerted facility management and the Brookhaven National Laboratory fire department. Facility management summoned a health physicist and an industrial hygienist to examine the material for the presence of radioactive or other hazardous materials before allowing the fire department to extinguish the fire. There were no injuries associated with this event. Mixed waste may contain flammable or pyrophoric substances, which, if ignited, could cause personnel injury or facility damage. (ORPS Report CH-BH-BNL-BNL-2000-0005).

Figure 1-1 provides an overall view of the waste pit area. Investigators determined that the fire started in one of the 32 supersacks filled with soil and shredded debris. A super sack is a waste container with a water-resistant outer covering and two layers of poly fabric. They determined that the waste filled supersacks were awaiting final characterization and shipment to an off-site disposal facility. Investigators also determined that the excavation pit waste was considered low level and although there was a history of pyrophorics and other hazardous materials present in the pit area, those materials should have been removed during the sorting and shredding operation. Investigators determined that organic rather than pyrophoric material located around the waste pit area was the most likely contributor to the combustion rate factor and that the fire started when temperatures exceeded 100 degrees Fahrenheit under the black poly-vinyl chloride sheet that covered the waste. They also determined that a waste-containing supersack, a polyurethane liner, and shredded personnel protective equipment were the main sources of combustion fuel. Investigators took infrared pictures of the waste material to identify possible heat sources, yet the results were inconclusive. They also determined that even though the waste contained low levels of Americium, Cesium, Thorium and Uranium it did not get hot enough to contribute to contamination spread.



Figure 1-1. Overall view of waste pit area

A similar event took place at this facility in October 1999 during the shredding operation when a container encapsulating a sodium-potassium mixture was shredded and caused other combustible materials to ignite. (OPRS Report CH-BH-BNL-BNL-1999-0020). Although fire investigators determined that the two events stem from different causes, corrective actions implemented in the October 1999 event do not appear to have solved the waste pit area combustion problem.

EH engineers identified the following similar events involving pyrophoric and other combustible materials. Operating Experience Summary 99-30 reported that on July 24, 1999, at the Fernald Site, a combustible metal fire occurred while workers were venting five gallon metal cans containing thorium metal by puncturing a hole in the lid of the cans. While venting the second can, they saw smoke coming from the puncture hole. Soon thereafter, the fire spread to an adjacent can and to cargo straps and netting restraining the cans to the floor. The workers and their supervisor used three Met-L-X fire extinguishers in an attempt to suppress the fire. They sprayed the extinguishing agent over the cans and attempted to spray it into the puncture holes. The flames outside the cans were extinguished but the contents of the cans continued to smolder. The work crew evacuated the building and summoned emergency response personnel, who placed both cans in a 30-gal drum and filled the drum with water to cool the reaction. Air samples indicated there was no release of airborne radioactivity, and surveys did not detect the spread of any contamination.

(ORPS Report OH-FN-FDF-FEMP-1999-0014)

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KEYWORDS: fire, combustion, waste combustibility

FUNCTIONAL AREAS: Fire Protection, Industrial Safety, Material Handling/Storage

8. ELECTRICAL SYSTEM IMPROPERLY GROUNDED

On March 6, 2000, at Los Alamos National Laboratory, an electrical engineer informed facility management that the Weapons Engineering Tritium Facility (WETF) electrical system was improperly grounded at the electrical substation. The situation was corrected the following day. An emergency diesel generator was activated for a 15-minute period to provide a continuous electrical supply to WETF while the line was moved from the neutral bus to the ground bus. There was no impact to the health and safety of personnel or the environment. More thorough electrical inspections at the time of installation might have averted this condition and precluded the unnecessary declaration of an Unreviewed Safety Question (USQ). (ORPS Report ALO-LA-LANL-TRITFACILS-2000-0003)

The WETF, Building 205, has been operating with three electrical buses that were not properly installed during the facility's initial construction in 1985: two improperly grounded lightly-used 208-volt busses and one 480-volt electrical bus. Investigators learned that this condition was discovered when electricians began wiring new equipment to the bus ducts. Facility management declared a USQ on January 7, 2000 (ORPS Report ALO-LA-LANL-TRITFACILS-2000-0001), and the electrical buses were de-energized and repaired with the necessary grounding kits.

Investigators determined that in 1998 an older unused facility, Building 450, had been refurbished to handle new equipment and new processes. Building 450 was attached to Building 205 with a change room between the two buildings. A new 13.2-kv to 480-volt three phase transformer was installed in May 1998 to take advantage of the existing electrical system for Building 205 to supply both buildings. The equipment ground from WETF was connected to the neutral bus of the switchgear on the secondary (480-volt) side of the transformer. This switchgear supplies power to Building 205 through a delta-connected circuit and to Building 405 through a three-phase four wire Y-connected circuit with a ground neutral. The entire refurbishing project was performed using a quality management plan. A third party "Title 3 Inspector" was present during the construction phase of the project, as was an independent testing company that tested the new transformer/substation. The electrical substation was electrically inspected in 1998, but Building 450 is not certified for occupancy and has not yet been turned over to the Technical Area-16 for operation.

Investigators learned that the improper grounding at the electrical substation was discovered during a walkdown of the entire electrical distribution system following the earlier occurrence at Building 205. Electrical engineers followed the ground wiring from the improperly grounded bus ducts to the termination at the 480-volt side of the new substation. The electrical engineers found the equipment ground terminated at the neutral bus instead of the ground bus. The improper installation of the system created a path for current to travel back into the facility in the event of a ground fault interruption condition. Based upon the earlier occurrence, this occurrence was also declared a USQ.

Investigators learned from discussions with a Los Alamos National Laboratory electrical engineer that this grounding problem would become evident only in a fault condition (i.e., a short circuit from a phase conductor to the grounded neutral). The circuit breakers would fail to trip during such an event because the improper ground termination would compromise the switchgear's fault detection capability. Circuit breaker testing is performed with the circuit breakers removed from the switchgear. Therefore, even regular circuit breaker maintenance would not uncover this grounding problem. The WETF equipment ground is electrically grounded because a bonded jumper

connects the neutral bus to ground. The grounding problem would only be detected by failure of the circuit breakers to open in a fault situation – a potentially hazardous condition.

EH engineers reported a similar occurrence involving improper grounding involving transformers in the following Summary.

- Operating Experience Summary 99-19 reported that at the Hanford Site, the facility manager for the Waste Receiving and Processing Facility reported that since January 1999, electricians and inspectors have found components in the facility's electrical distribution system that were not in compliance with the National Electrical Code (NEC). These noncompliances involved improper transformer grounding, incorrect circuit breaker ratings, and too many electrical conductors in a raceway. They were introduced into the facility when it was constructed several years ago by a work force composed of personnel from six different companies. The NEC provides for the practical safeguarding of people and property against hazards such as fires or electric shocks caused by faulty electrical circuitry or components. (ORPS Report RL--PHMC-WRAP-1999-0002)

KEYWORDS: improper electrical grounding, electrical bus, switchgear, circuit breaker, transformer

FUNCTIONAL AREAS: Construction, Electrical Engineering

9. WORKER PINNED BY THREE THOUSAND POUND WASTE CRATE

On March 14, 2000, at Rocky Flats, a decontamination and decommissioning worker was pinned between a moveable crate and a door jamb while he and a second worker transported the crate over a berm and through a series of doorways. The first worker sustained a pulled rotator cuff muscle, a bruised forearm, and a lacerated ear. The second worker strained his shoulder when he attempted to pull the cart away from the first worker. Both individuals reported to the site medical facility for an evaluation and were released. Facility management held a fact-finding meeting to identify the event cause and generate corrective actions. There were no other injuries associated with this occurrence. Cumbersome objects can cause serious injury to personnel when they are moved without proper equipment, adequate procedure, and sufficient manpower. (ORPS Report RFO--KHLL-SOLIDWST-2000-0014)

The decontamination and decommissioning program uses the crates to transport waste out of the facility. Investigators determined that two dollies are normally used to lift the crates for transport because the crates do not have wheels. They determined that a supervisor guided the two workers as they pushed the three thousand pound crate over the berm and through a series of doorways. Investigators determined that the incident occurred when the workers lost control of the crate as they negotiated the berm and two doorways. They determined that as the crate entered the second doorway, the first worker was distracted when he stepped on a rubber doorstop and lost his footing. Investigators determined that the second worker tried unsuccessfully to stop the crate before it pinned the first worker against the door jamb.

During the fact-finding meeting, investigators determined that the job hazards analysis did not include a procedure for, or the hazards associated with, crate transportation. Corrective actions include:

- Revising the job hazards analysis to include information regarding the required number of workers to move a crate safely;
- Performing an equipment evaluation to determine if current crate transport practices are adequate;
- Evaluating the need for berms in the facility.

KEYWORDS: heavy objects, pinned

FUNCTIONAL AREAS: Industrial Safety, Job Planning